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Engineering Array

- Objectives
- Progress and Status
- Accomplishments
- Cost
- Construction
- Summary

Auger Project
Engineering Array Objectives

The primary objective of the Engineering Array was to evaluate the performance of every component and system in the field before proceeding to full production and deployment.

The particular objectives were:

- **Validation of the design and performance of:**
  - **prototype surface detector stations with their power systems and electronics under field conditions.**
  - **fluorescence detectors, their enclosure and supporting systems.**

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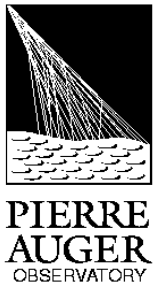
Engineering Array Objectives
Continued

  - data communications system.
  - data acquisition system.
  - hybrid surface/fluorescence operation by simultaneous recording of showers.
  - deployment strategies subject to seasonal and weather constraints.
- Understanding of the detailed costs of both the components and their installation in order to plan for production and full deployment. These costs are contained in the Auger Project Work Breakdown Structure (WBS).
- Fine-tuning of the construction schedule based on actual installation experience and increased efficiencies.



Engineering Array Status
Fluorescence Detector

- First Fluorescence Detector Building at Los Leones Completed.
- Two prototype telescopes installed and operational.
- First showers recorded
- Commissioning underway.
- Performance confirmed with both showers and laser shots.

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The Fluorescence Detector Building at Los Leones

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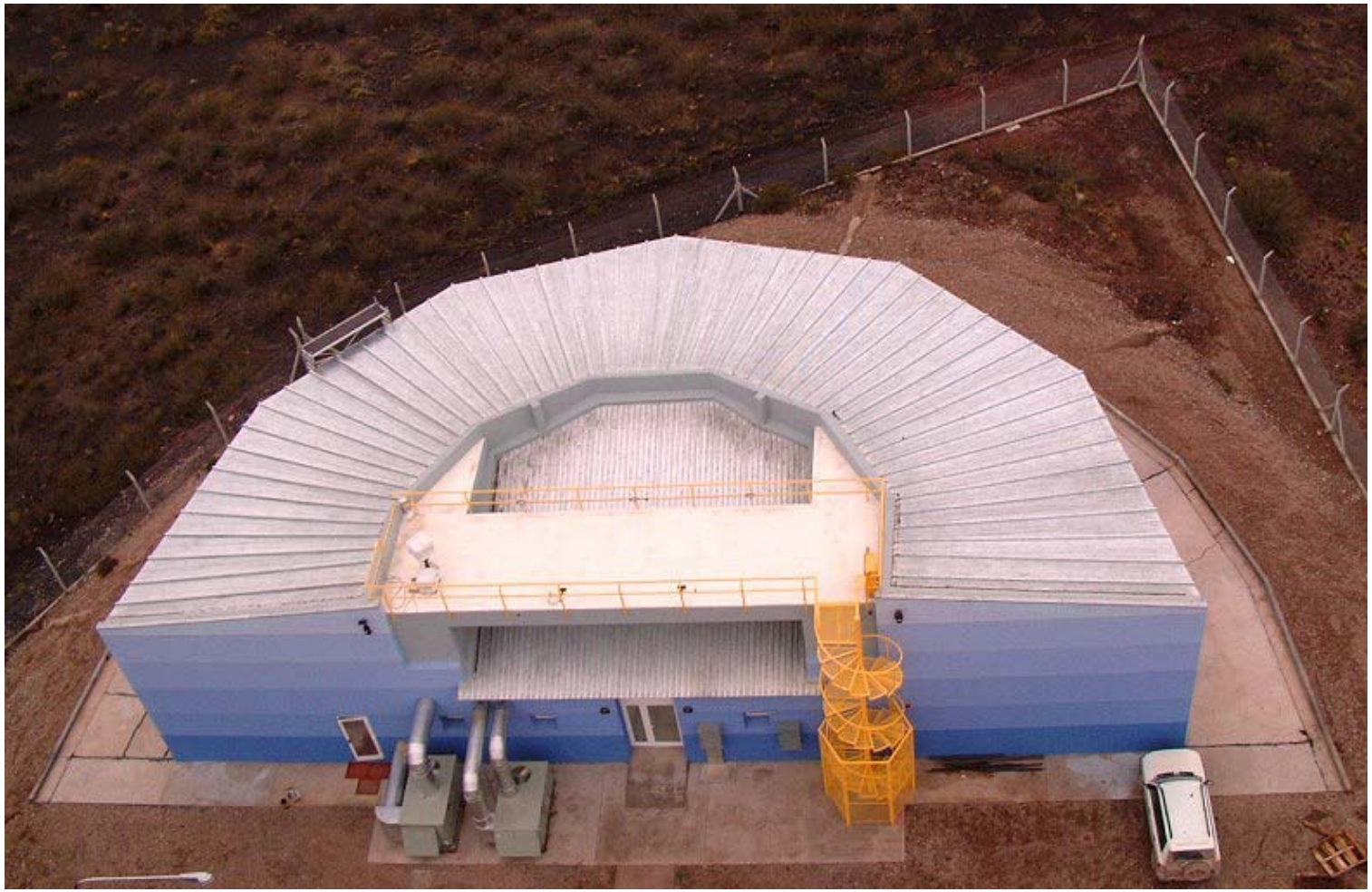
Los Leones Fluorescence Building



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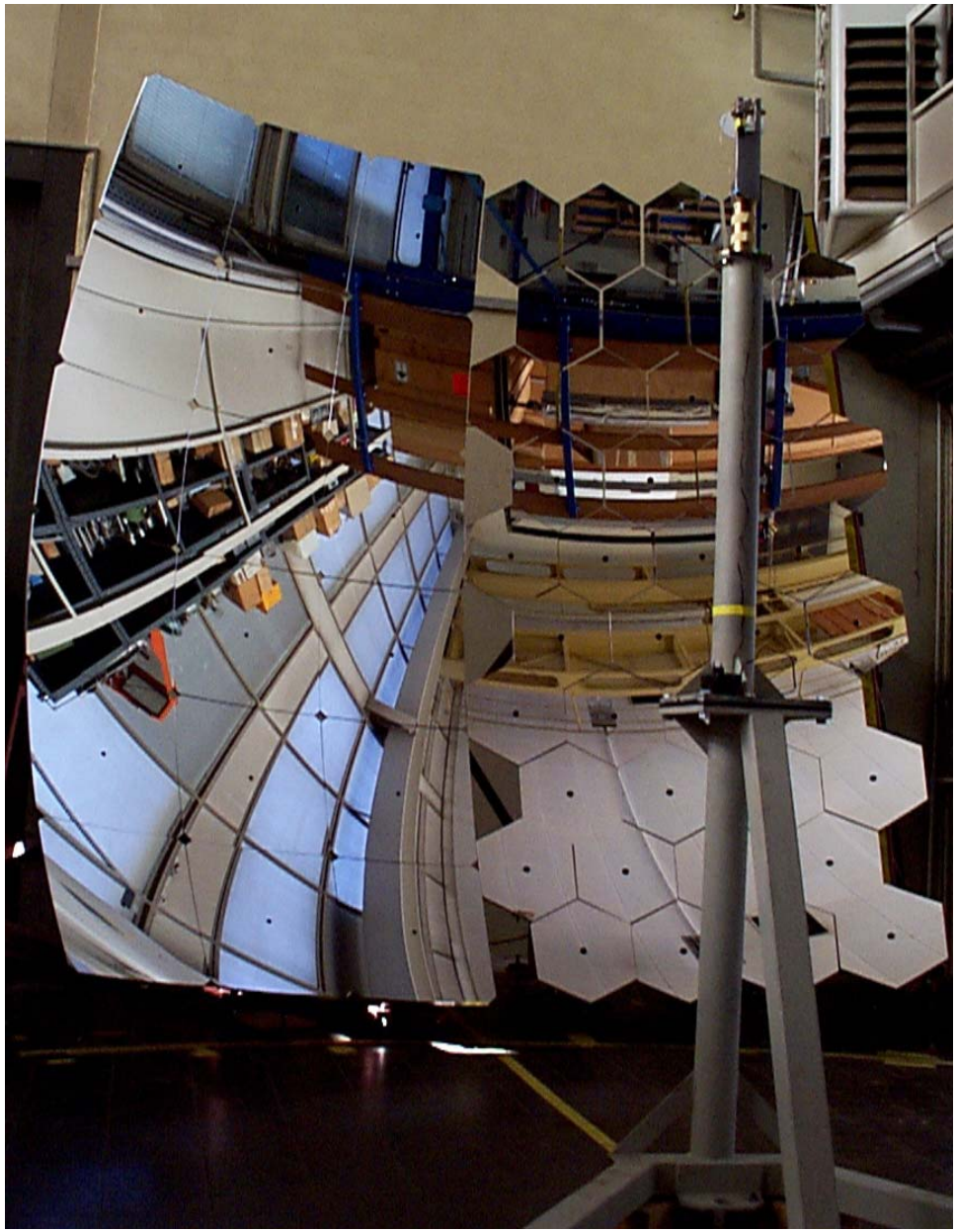
Czech/German Prototype Mirror



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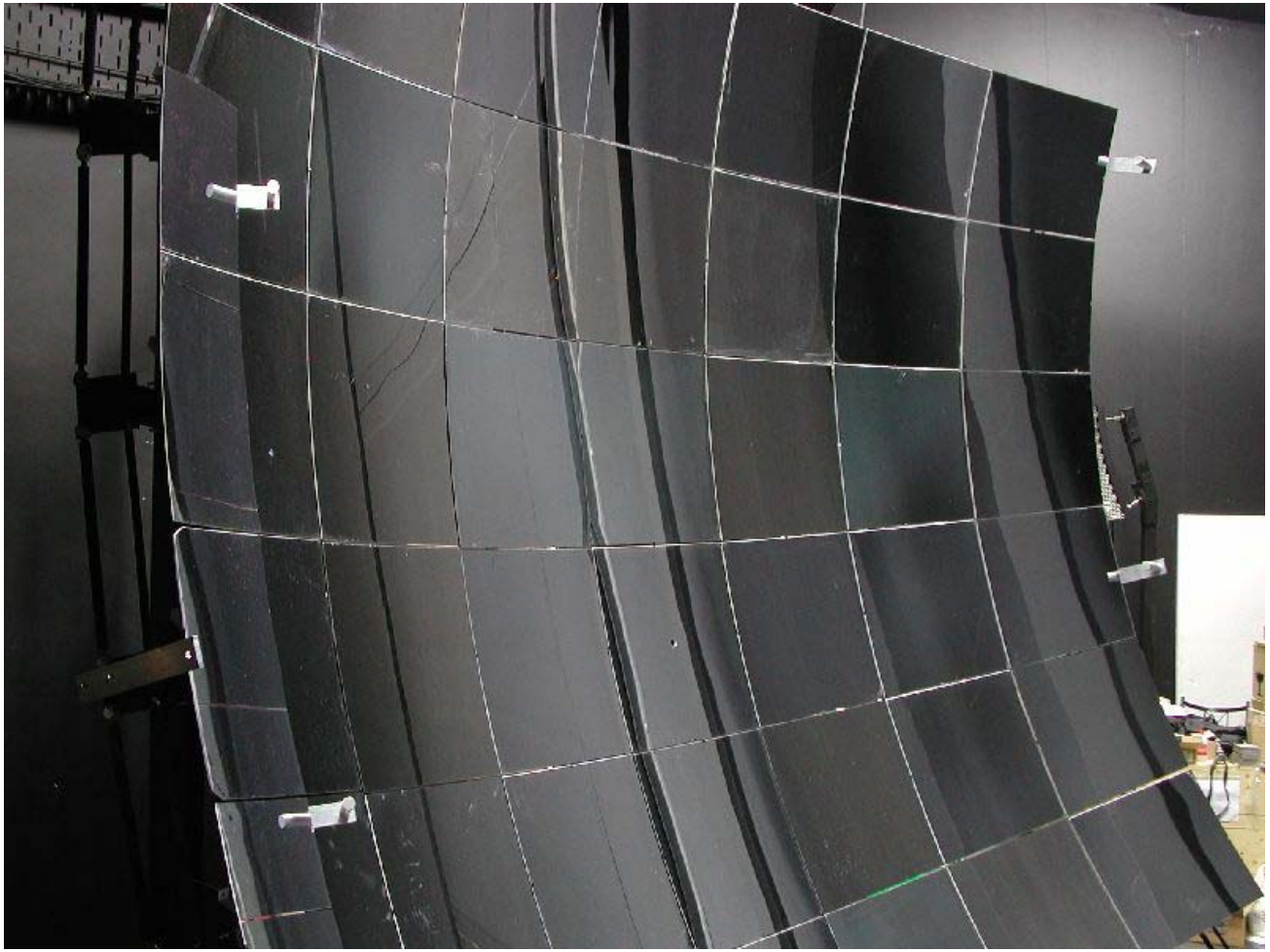
Italian prototype mirror



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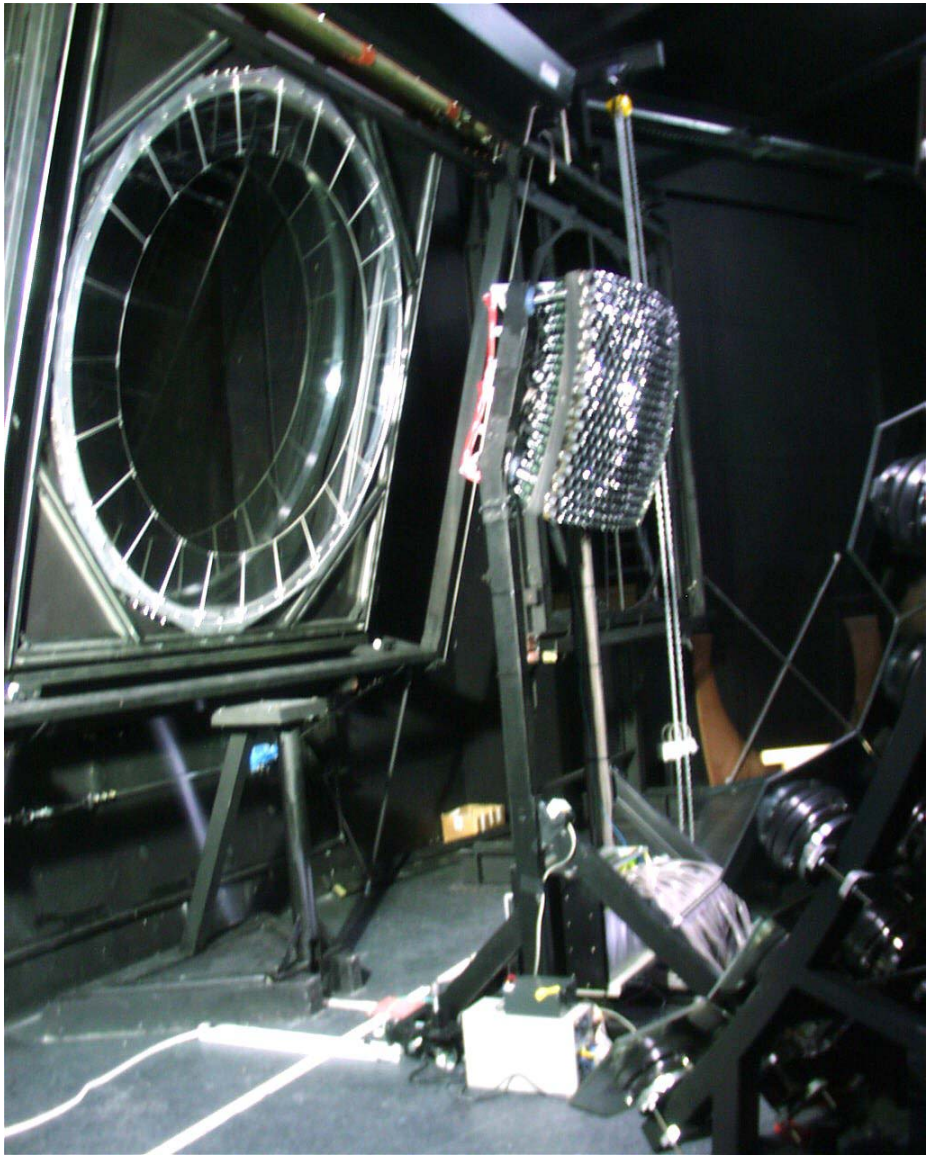
Fluorescence Detector

Camera and aperture box with uv filter and Schmidt corrector



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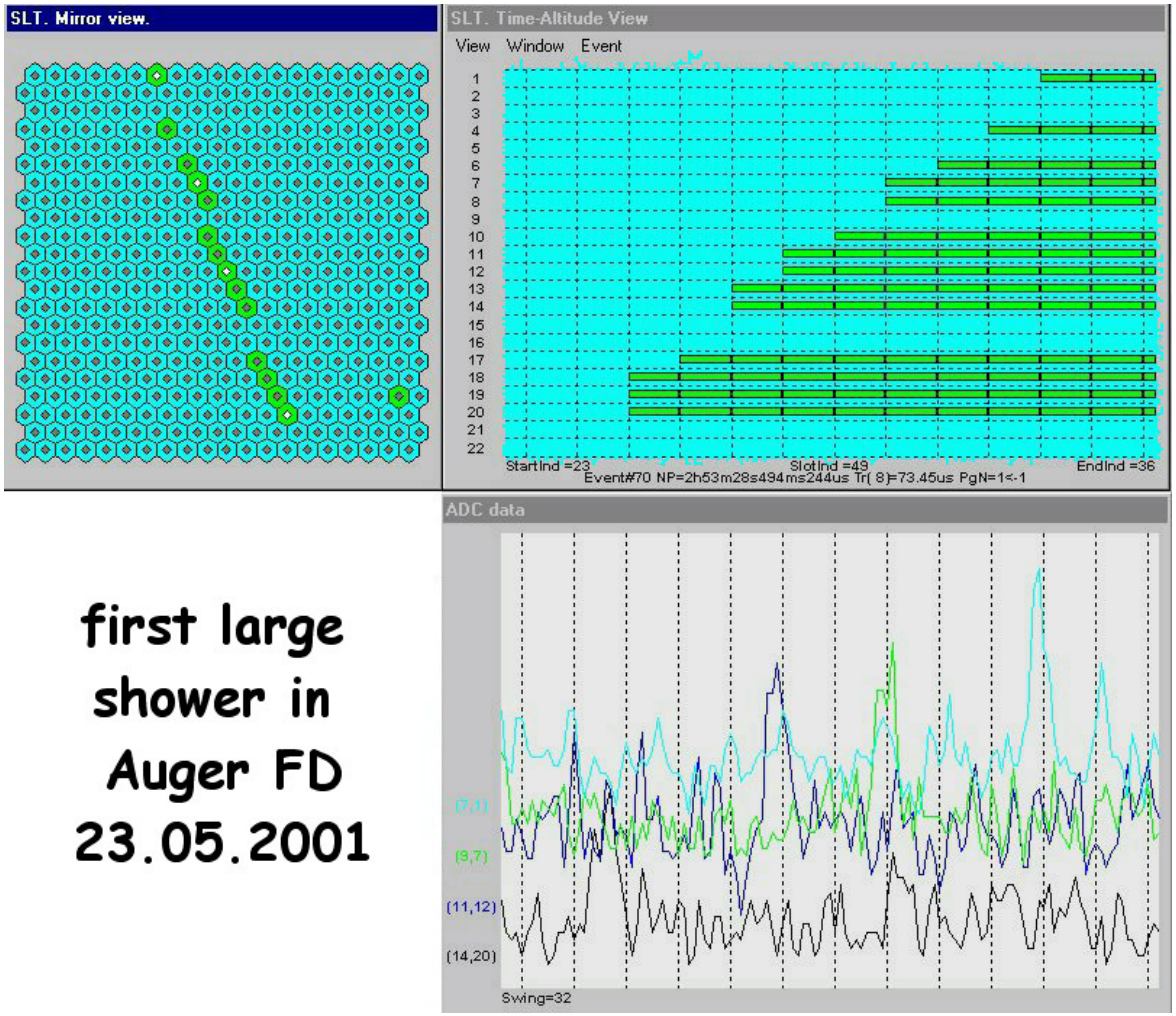
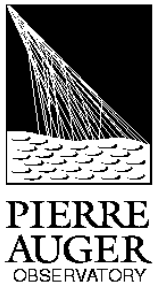
Official First FD Event



first large shower in Auger FD 23.05.2001



Engineering Array
Prototype Surface Array

- Forty detector stations deployed and filled with high purity water.
- PMTs, power systems, radios installed on nearly all tanks.
- Electronics packages are being installed.
- Currently 19 detector stations are sending T2 triggers.

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Surface detectors being prepared for deployment

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Deploying the Surface Detectors

First EA Tank
21 February 00

Last EA Tank
26 April 01

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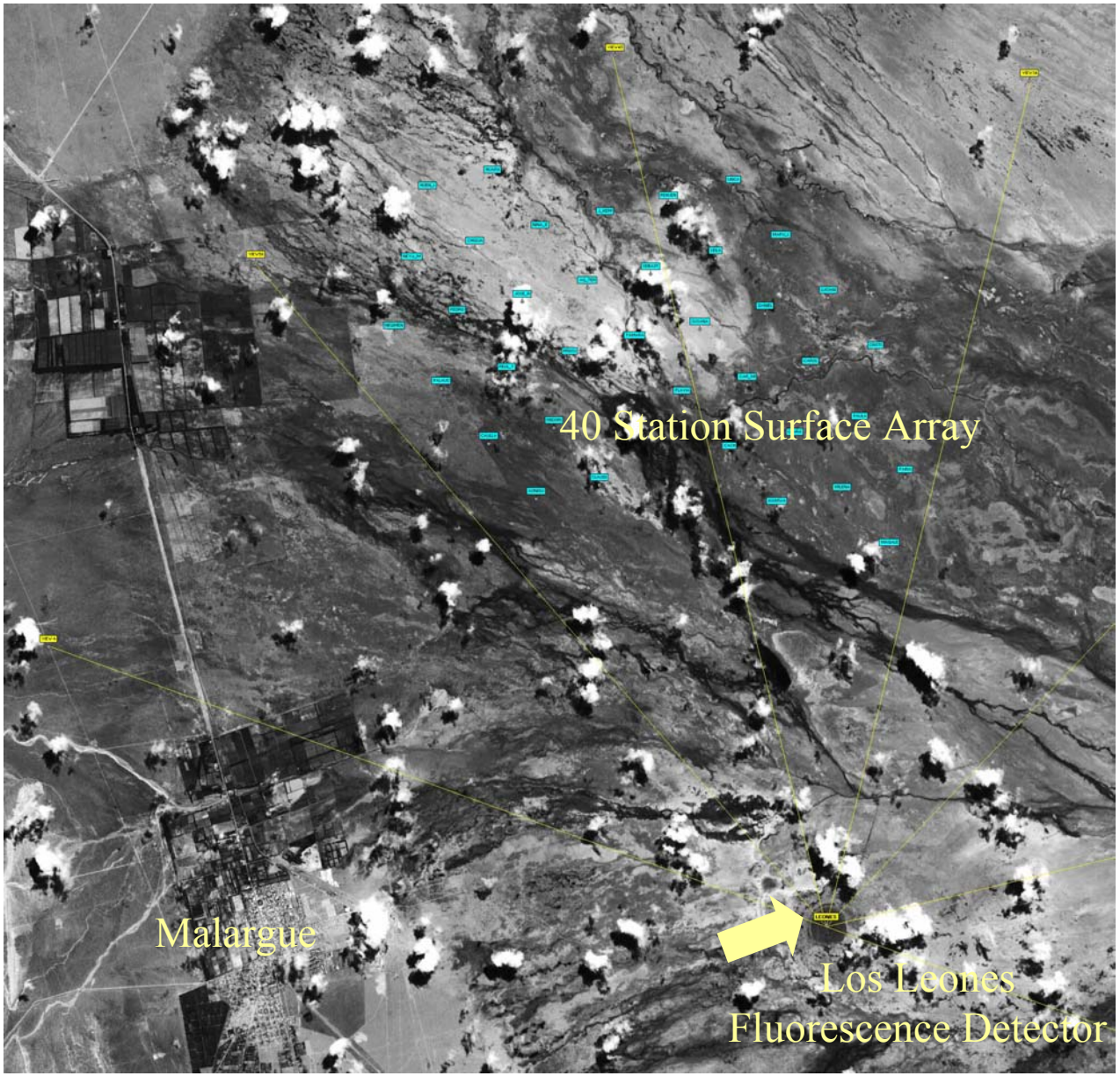
Auger Engineering Array



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Communications System

- Concentrator tower for detectors on the southern side of site and mircowave link to the Auger Campus installed.
- Tower at the Auger Campus installed.
- Radios installed and operational on Engineering Array surface detector stations
- Successful end to end operation of the data communications system for the Engineering Array.
- Voice communications system over the area of the Engineering Array operational.

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The Fluorescence Detector Building and concentrator antenna tower at Los Leones

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Detector Assembly Building with communications tower

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Central Data Acquisition System

- **Central Data Acquisition System (CDAS) is operational.**
- **Data acquisition will move from the Detector Assembly building to the Auger Center Building.**

Auger Campus

Construction at the Auger Campus is complete

- **Detector Assembly Building**
- **Auger Center Building**
- **Communications tower**
- **Satellite link**
- **Quincho**

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Lessons of the Engineering Array

- Access to the site is season and weather dependent particularly for water deployment.
- Reduce possibility of detector damage from animals in the Pampa.
- Minimize cables and connectors.
- Get interlocks up and running early.

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Don’t get stuck!

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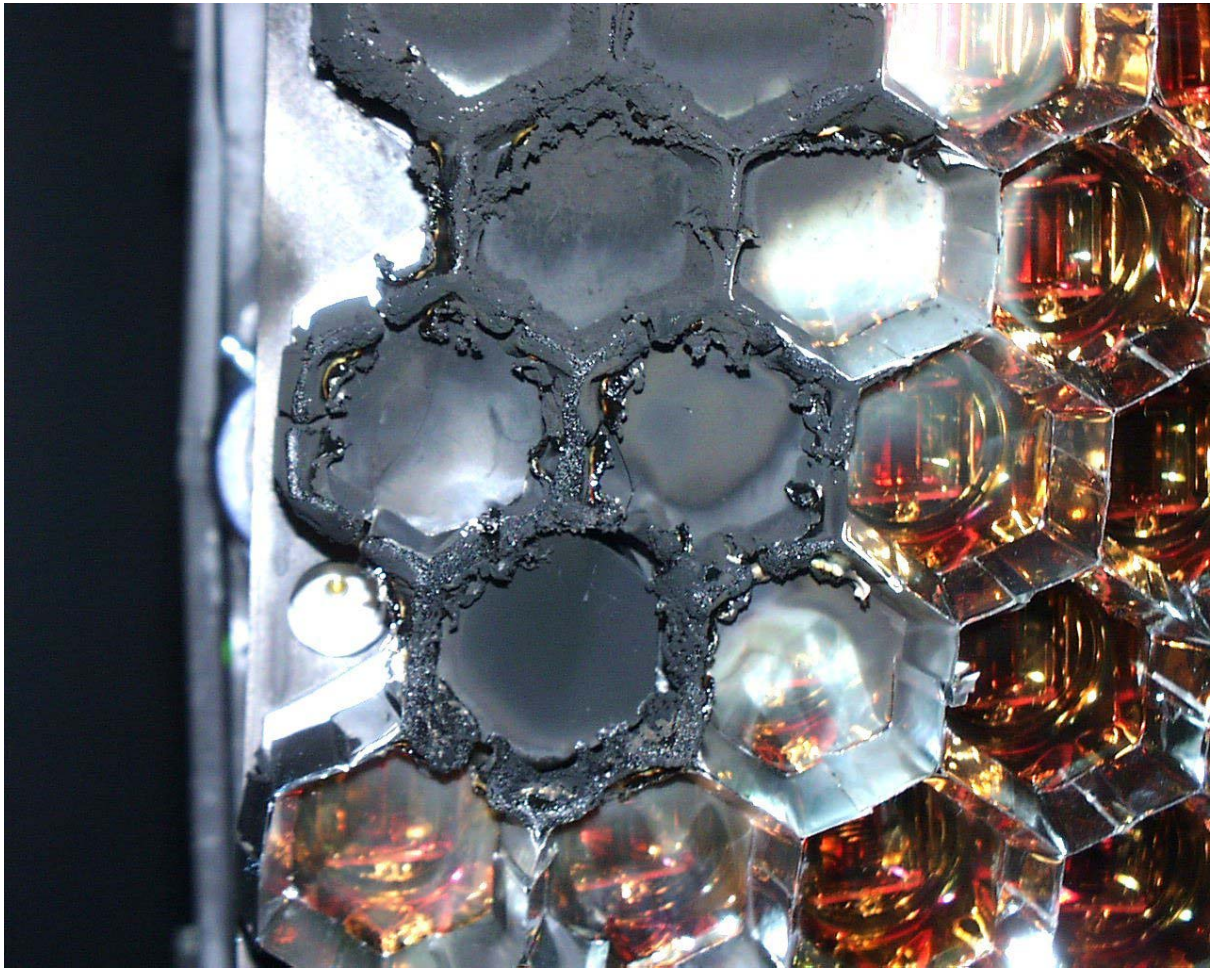
Get interlocks up and running!



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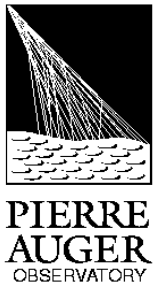

Accomplishments

• January 2000	Engineering Array started
• February 21, 2000	First EA tank deployed
• March 15, 2001	Fluorescence Building at Los Leones complete
• May 23, 2001	First shower events recorded in the fluorescence detector
• August 2, 2001	First surface array shower recorded

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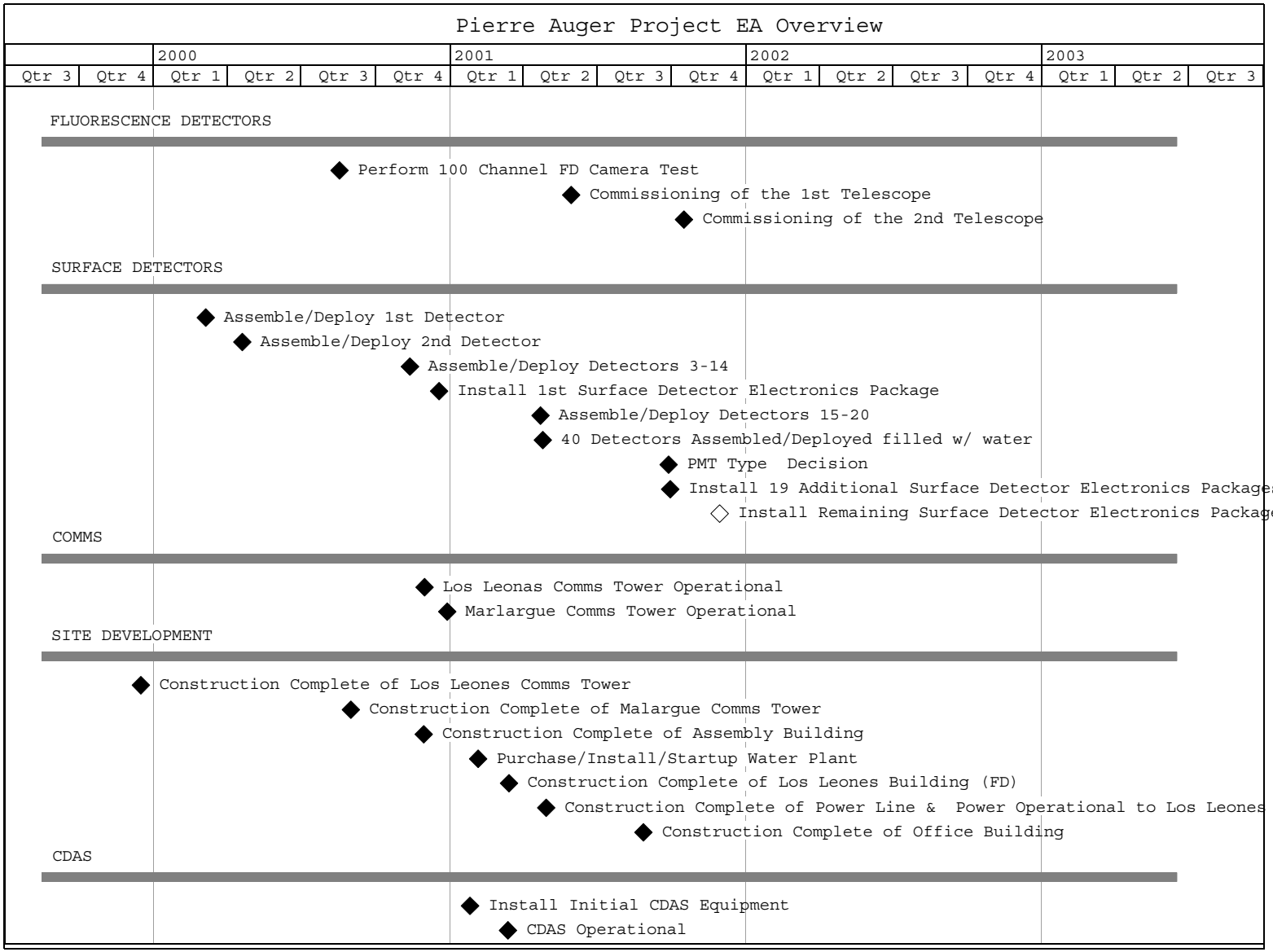

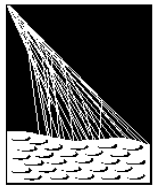
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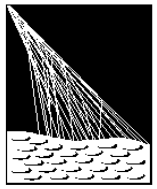

Engineering Array Costs

WBS	Description	March 99 Budget	Actual
1.0	Fluorescence detectors	2350.6	2527.7
2.0	Surface detectors	3722.8	2304.9
3.0	Communications	376.4	879.7
4.0	Data Acquisition	208.9	202.8
5.0	Data Processing		
6.0	Site Development	2434.9	3295.1
7.0	Project Management	878.0	538.4
Total		9971.6	9748.6

Fluorescence Detector Construction

Plans and Schedule

- Begin construction installation at the Los Leones building in March.
- Begin Construction of the next fluorescence building (Coihueco) in November.
- Begin telescope installation at Coihueco in June.
- Complete all fluorescence detector construction and installation by September 2004.

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SD Construction

Plans and Schedule

- Detector station deployment is driven by seasons and weather.
- Detector stations will be completely assembled and tested prior to deployment.
- Pre-production deployment schedule constrained by PMTs and bases.
- Begin pre-production deployment of the surface array in March/April 2002.
- Begin production deployment in in October 2002.
- Problem: disconnect between deployment and availability of station electronics.

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Summary

- **The Engineering Array is 90% complete and is expected to be finished *as planned* by the end of 2001**
- **All detector, communications and data acquisition systems have been successfully tested.**
- **Air shower events have been recorded by both the fluorescence and surface detectors.**
- **The Engineering Array was build on budget.**

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Plans

- The Engineering Array has been (remarkably) successful.
- Hybrid events will confirm the integration of the two detector systems.
- As a result of the EA experience we are
  - Revising designs
  - Improving deployment procedures
  - Tuning the cost estimate
  - Refining the deployment schedule
- Full construction will begin in 2002

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Surface Detector inspection by residents of the Pampa

Auger FB review, Malargüe, October 2001.
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